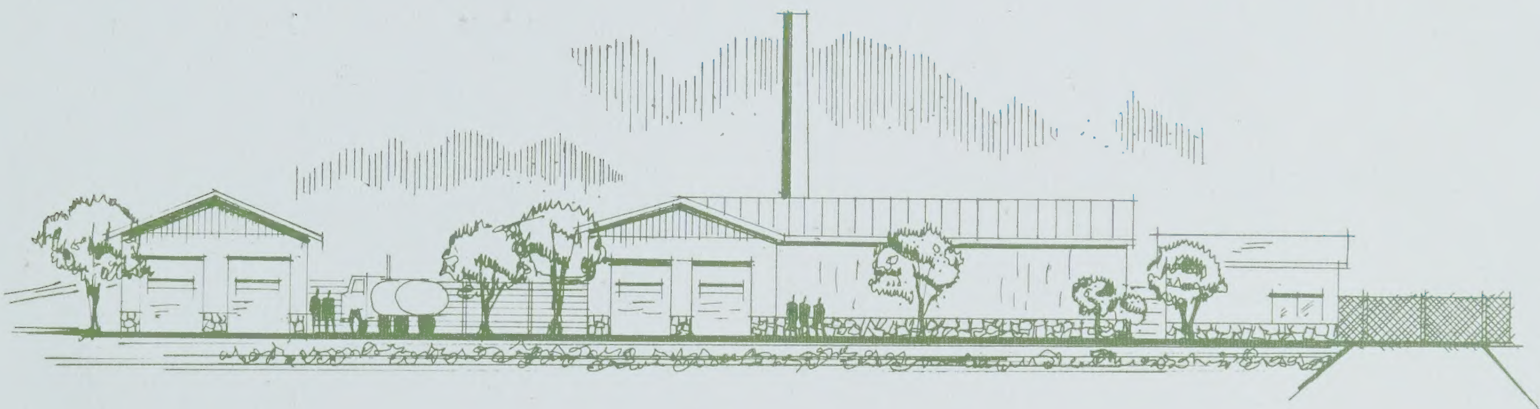
AN ACTION PLAN FOR TREATMENT AND DISPOSAL OF TOXIC AND HAZARDOUS WASTES

in

The Province of Alberta



PREPARED FOR

THE DEPARTMENT OF THE ENVIRONMENT

November 1972

AESL/GOODFELLOW GROUP

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November 2, 1972

The Honorable W. J. Yurko, P.Eng.,
Minister of the Department of the Environment,
Legislative Building,
EDMONTON, Alberta.

Dear Mr. Yurko:

We take pleasure in submitting our report entitled "An Action Plan for Treatment and Disposal of Toxic and Hazardous Wastes in the Province of Alberta", which was commissioned by your Department in September 1972. The report describes the current toxic and hazardous waste problem, and proposes a first stage development of central Waste Treatment and Disposal Facilities.

Recent surveys indicated that over 80 million pounds of solid waste and six million gallons of liquid waste, produced each year in the Province of Alberta, are not receiving adequate treatment. They originate in Provincial institutions and small industries and many of them are toxic or hazardous in nature. Adequate treatment and disposal of these wastes by the most efficient systems available is essential, as they constitute an ever increasing threat to public health and to the environment. Inasmuch as appropriate treatment facilities are specialized and often complex, individual waste treatment installations at the source of the problem would be inefficient and costly, compared to central Waste Treatment and Disposal Facilities professionally operated under Government control.

The facilities proposed in the first stage development would provide a safe and economic means for treatment and disposal of approximately 80% of the current production of toxic and hazardous wastes, without generating alternate environmental problems.

We believe the Province has a remarkable opportunity to provide a timely solution to a serious and immediate problem. If in the course of doing so, a planned program for additions to the initial facility capability can be adopted, this action will unquestionably place Alberta in a pre-eminent position on the continent with respect to waste treatment.

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The Honorable W. J. Yurko, P.Eng.

We trust you will find our recommendation for a plan of action responds to optimization of both short and long term waste treatment requirements, and economic realities.

Respectfully submitted,

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Att.

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in

The Province of Alberta

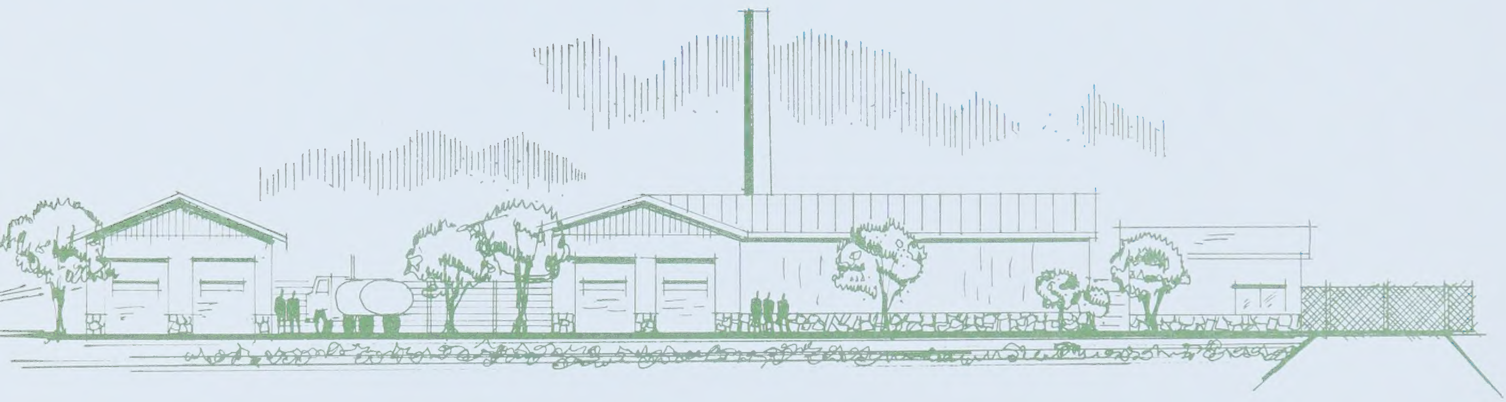

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TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

I. SYNOPSIS

Requirement

Toxic and hazardous wastes from institutions and major industries in the Province of Alberta are not being adequately dealt with and constitute a serious threat to public health. Quantities now being generated are sufficient to justify the establishment of centralized, systematic and effective Waste Treatment and Disposal Facilities.

This conclusion was reached in the Multiple Waste Treatment and Disposal Report, March 1972, prepared for the Department of the Environment of the Government of Alberta.

Approximate annual production of the wastes requiring more effective treatment includes: nearly 1,000,000 pounds of pathological solids (dead animals); 82,000,000 pounds of paper products some of which is toxic or contaminated; more than 5,000,000 gallons of oily liquids; 1,000,000 gallons of miscellaneous chemical and biological liquids; and 15,000 pounds of miscellaneous solids, including radioactive substances.

Proposal

The logical development of such facilities would be by stages. The first stage would be a plant in the Edmonton region where the largest part of these wastes originate. The second stage would be a complementary plant in the Calgary area. Subsequent stages would provide additional facilities as required. The estimated capital cost for the first stage development would be $2,125,000 and the annual operating cost about $500,000. Total cost of all stages has been estimated to be in the order of $7,000,000.

The Edmonton plant, sited and designed with due consideration for efficiency and aesthetic considerations, would have the initial capability of pollution-free disposal of the pathological, cellulosic and oily liquid wastes, which constitute approximately 80 per cent of the wastes requiring treatment. The treatment of miscellaneous wastes, using chemical or biological facilities, would require higher unit capital and operating costs and would be provided for in subsequent stages.

Operation of the Stage I Edmonton plant would provide employment for a full-time staff of approximately 20 people. Preliminary studies are already completed and detailed planning, design and construction would take approximately one year.

An efficient system for treatment and disposal of these waste materials would place the Government of Alberta in the forefront in the battle against this kind of pollution. Through its flexibility and potentiality for expansion, the system would enable the Province to handle progressively, and economically, this existing and ever-increasing threat to public health and the environment.

II. TOXIC AND HAZARDOUS WASTE PROBLEM

General

The Multiple Waste Treatment and Disposal report dated March 1972 pointed out that more than 80 million pounds of solid waste and six million gallons of liquid waste are receiving inadequate treatment in Alberta. These wastes originate in provincial institutions and small industries, and many of them are toxic or hazardous in nature. They require treatment and disposal by the most efficient methods available as they constitute a serious threat to the environment and to public health.

Solid pollutants which require treatment are composed of:

1. pathological wastes (900,000 pounds per year), originating in university animal research centres, medical schools, veterinary hospitals and general hospitals;

2. cellulosic wastes (80 - 90,000,000 pounds per year), often toxic or contaminated with pathological bacteria, and originating in hospitals and university animal farms.

3. miscellaneous solids, some of them radioactive (15,000 pounds per year).

Small industries are the chief source of liquid hydrocarbons, such as oil and paint sludge, totalling 5,400,000 gallons per year; with miscellaneous chemical liquids at 1,000,000 gallons per year making up the balance.

The treatment of each of these categories of waste is specialized and often complex. Individual waste treatment installations at the source of the problems would be both inefficient and costly, compared to collection and disposal by a controlled, centralized and professionally operated facility. In addition, a reasonable charge to industries utilizing the facilities would partially offset the cost of treating the wastes from provincial institutions.

Pathological Wastes

The pathological wastes originate primarily in the university animal research centres, medical schools, veterinary hospitals and general hospitals. The quantities of these wastes indicated in the report are considered to be low due to the reluctance of many individuals to discuss this subject. Whereas some small quantities of pathological wastes are disposed of by efficient incineration, larger quantities, including wastes from animal hospitals, go to land fill, and it is reported that some human pathological tissue is garburated into municipal sewer systems.

Cellulosic Wastes

The cellulosic or paper wastes originate primarily in the hospitals as disposable paper items. Many of these wastes are toxic or contaminated, but the percentage is unknown since there is no attempt being made to separate them from ordinary hospital wastes. In addition, there are significant quantities of shavings or bedding materials requiring adequate disposal from the university animal farms. Currently there are a variety of disposal methods and they include - incineration at the Foothills Hospital, incineration in an inadequate facility at the University Hospital, shredding and compaction with other paper wastes at the Royal Alexandra Hospital and disposal in land fill from some of the university laboratories. The problem may be more acute in the Edmonton area where some of the institutions are older. There is no doubt that a central disposal facility is required to handle this problem.

Liquid Hydrocarbon Wastes

Liquid hydrocarbons such as used motor oil, oily wastes and paint sludge originate primarily in small industries that cannot economically provide adequate treatment. A reasonable charge for disposal of these wastes at a central treatment facility would partially offset the cost of treating institutional wastes. Smaller quantities of hydrocarbon solvents, ethers and other flammable material originate in the universities and hospitals and present a very pressing disposal problem. The quantities of liquid hydrocarbons indicated in this report are in addition to such wastes produced by major industrial plants having sophisticated treatment facilities.

Miscellaneous Liquids and Solids

The miscellaneous liquids and solids consist of a very wide variety of materials that would require complex biological or physiochemical treatment or long term storage. Most would have to be handled on an individual basis and each generally represents a serious disposal problem to the institutions or industries.

Table I summarizes the quantities of wastes listed in the Multiple Waste Treatment and Disposal report by source and recommended method of disposal.

TABLE I

MULTIPLE WASTE TREATMENT AND DISPOSAL REPORT

SUMMARY OF WASTES BY SOURCE AND DISPOSAL METHOD

SOURCE OF WASTE	METHOD FOR DISPOSAL OF WASTE							
	PATHOLOGICAL INCINERATION (lbs)	CELLULOSIC INCINERATION (lbs)	LIQUID INCINERATION (gal)	LONG TERM STORAGE (lbs)	SANITARY LAND FILL	CHEMICAL (gal)	BIOLOGICAL (gal)	DEEP WELL
UNIVERSITIES	508,500		13,500	8,600 1,900 litres		75,600	540,000	
HOSPITALS	403,100	81,600,000	24,800					
TECHNICAL SCHOOLS EXPERIMENTAL STATIONS			7,500	15		140 lbs		
INDUSTRY			5,345,000			359,000		
TOTAL	911,600	81,600,000	5,390,800	13,000		434,600	540,000	
TREATMENT STAGE I	60%	60%	100%	D.R.E.S.	Provided	-	-	-
TREATMENT FUTURE STAGES	40%	40%	-	Planned	-	100%	100%	Planned

III. PROPOSED DEVELOPMENT

TREATMENT METHODS AVAILABLE

General

A wide range of treatment methods under the general headings of biological, physical, chemical, and thermal are available for the disposal of waste materials.

Biological treatment methods are appropriate for uniform waste streams containing mostly organic matter. Physical and chemical treatment methods have application where the waste stream is of a specific composition containing a particular form of contaminant. Incineration is the most appropriate method of treating hydrocarbon wastes as well as carbonaceous by-products from biological, physical or chemical treatment processes.

Suitable biological, physical or chemical treatment processes may be selected for a known waste stream, however, it is impossible to design a simple combination biological-physiochemical treatment plant to handle an infinite variety of industrial waste liquids.

Incineration is the most effective method available for the ultimate disposal of hydrocarbons, sludges and other waste concentrates. Once the necessity for incineration is established it is reasonable to apply it to the maximum extent to the full range of such waste materials.

Successful incineration depends on proper equipment selection and operation. The incinerator must be designed around the waste characteristics. There is no one incinerator that will handle all the materials that might be directed to a Multiple Waste Treatment and Disposal Facility.

The principal criteria applicable to successful incineration are - process reliability, residue quality, environmental pollution, safety and cost. The prime functions of incineration are reduction of volume and mass and sterilization.

Heat energy from incineration can only be economically recovered in a very large installation with a continuous and uniform supply of waste fuel. The nature of operation and size of the facilities proposed in this report do not justify the installation of heat recovery equipment.

Solid Waste Incinerators

The relatively small annual production of solid wastes reported dictates the use of standard package type incinerators. There are several companies, some local, that manufacture efficient units for the incineration of pathological wastes.

It is conceived that a pathological incinerator would be sized to handle the largest waste anticipated (about 1,000 pounds charging rate). Radioactive wastes would be incinerated in this unit with provision made to receive and handle the hot ash in a safe and acceptable manner.

A standard package type solid waste unit with a mechanical charger would be considered for the cellulosic solids. The size of this unit would be determined after a more detailed examination of the cellulosic waste problem. However, a unit of about one ton per hour capacity would possibly be the most economic and efficient.

Liquid Waste Incinerators

Two general types of incinerators would be considered for liquid waste incineration. These are: Atomizing Chamber Type Incinerators and Fluid Bed Incinerators.

The normal range of liquid waste incinerators utilize atomizing burners within a furnace chamber. To obtain effective operation it is necessary to blend the fuels carefully and adjust the furnace operation to achieve constant input ratios of fuel mixtures, other liquid mixtures, and air. This type of incinerator is sensitive to varying feed ratios and requires a relatively high combustible content in the waste, or added fuel to support combustion with aqueous solutions.

The fluidized bed combustion process consists of a reaction vessel containing a bed of particles which are fluidized by an air stream passing through an orifice plate at the bottom of the bed. To put the unit in operation, preheated air is introduced to fluidize the bed of solids and fuel added to raise the bed temperature up to about 1300°F at which point the waste liquid materials are introduced into the fluidized bed. The fluidized bed process offers some advantages over the atomizing combustion chamber type incinerator, but the fluid bed unit is more expensive to construct and operate. The final choice of unit must be made after a detailed review of the wastes to be treated.

A liquid waste incinerator would be sized to dispose of approximately 5,000,000 gallons per year of liquid wastes.

Chemical Burning Pit

Chemical burning pits are often used in the oil field where wastes are traditionaly burned in open pits and air pollution control is limited. Such units have been used for many years around chemical plants to handle small quantities of explosive materials. An adaptation of this system would be constructed at the central treatment plant to dispose of the numerous small quantities of explosive chemicals generated at the universities.

GENERAL DESCRIPTION OF PROPOSED PLANT

Figures 1 and 2 show the proposed layout for the first stage development of the Multiple Waste Treatment and Disposal Facilities. The plant would be located on an industrial site of not less than eighty acres with approximately fifteen acres developed as a plant site and the balance reserved for buffer zones, landfill sites and future development. The building site would be set back on the property approximately 200 feet. Topsoil removed during construction would be graded in this area and landscaped to provide a park-like front and to screen the working area from the public road. The building site would be enclosed in a chain link fence with controlled access. The office-laboratory building would be given architectural treatment so as to present a pleasing external appearance. The treatment and workshop buildings would be steel. A ramp would be constructed between the treatment area and the storage area to provide for gravity unloading of liquid wastes and a fire wall between treatment and storage areas.

The plant would be designed initially to provide liquid and solids incineration. A T-shaped building has been envisaged with common facilities such as workshops and heating plant located in the centre. Initially the building would have the solids waste incinerators in one wing and the liquid waste incinerator and transfer pumps in a second wing. A future third wing would house the biological/physiochemical facilities to be installed in a subsequent stage of the development of the facilities.

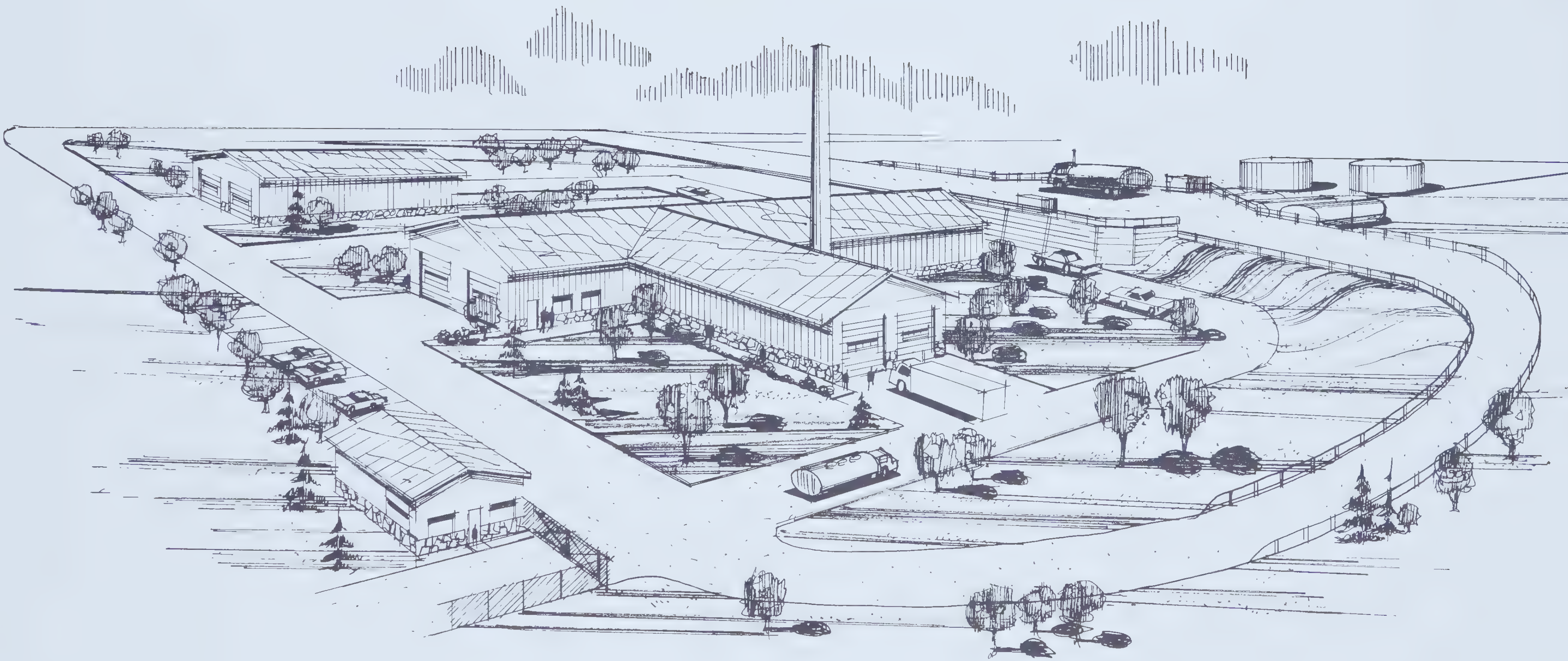
Since material would be received in relatively small batches, it would be necessary to install adequate storage facilities to allow for blending of liquid wastes, and segregation of solid wastes. A warehouse would be provided for holding miscellaneous packaged solid or liquid wastes such as pesticides.

Figure No. 3 indicates schematically the flow of wastes through a multiple waste disposal facility in the first and later stages of development. The scrubbers shown on the incinerators would be provided as required to ensure stack effluents met air quality standards. Permanent storage and deep well disposal facilities would be arranged for at off-site locations if required.

Table II contains an order of magnitude estimate of cost of the proposed Stage I development of the Multiple Waste Treatment and Disposal Facilities.

Stage I - Treatment and Disposal

The most appropriate method of treating waste materials containing hydrocarbons or similar combustible components is by incineration. Since the bulk of the wastes fall into this category the maximum reduction in waste volume could be achieved with an initial development providing a combination of liquid and solids incineration.



CONCEPT SKETCH
EDMONTON REGION
MULTIPLE WASTE DISPOSAL FACILITY
STAGE I DEVELOPMENT

FIGURE No. 1

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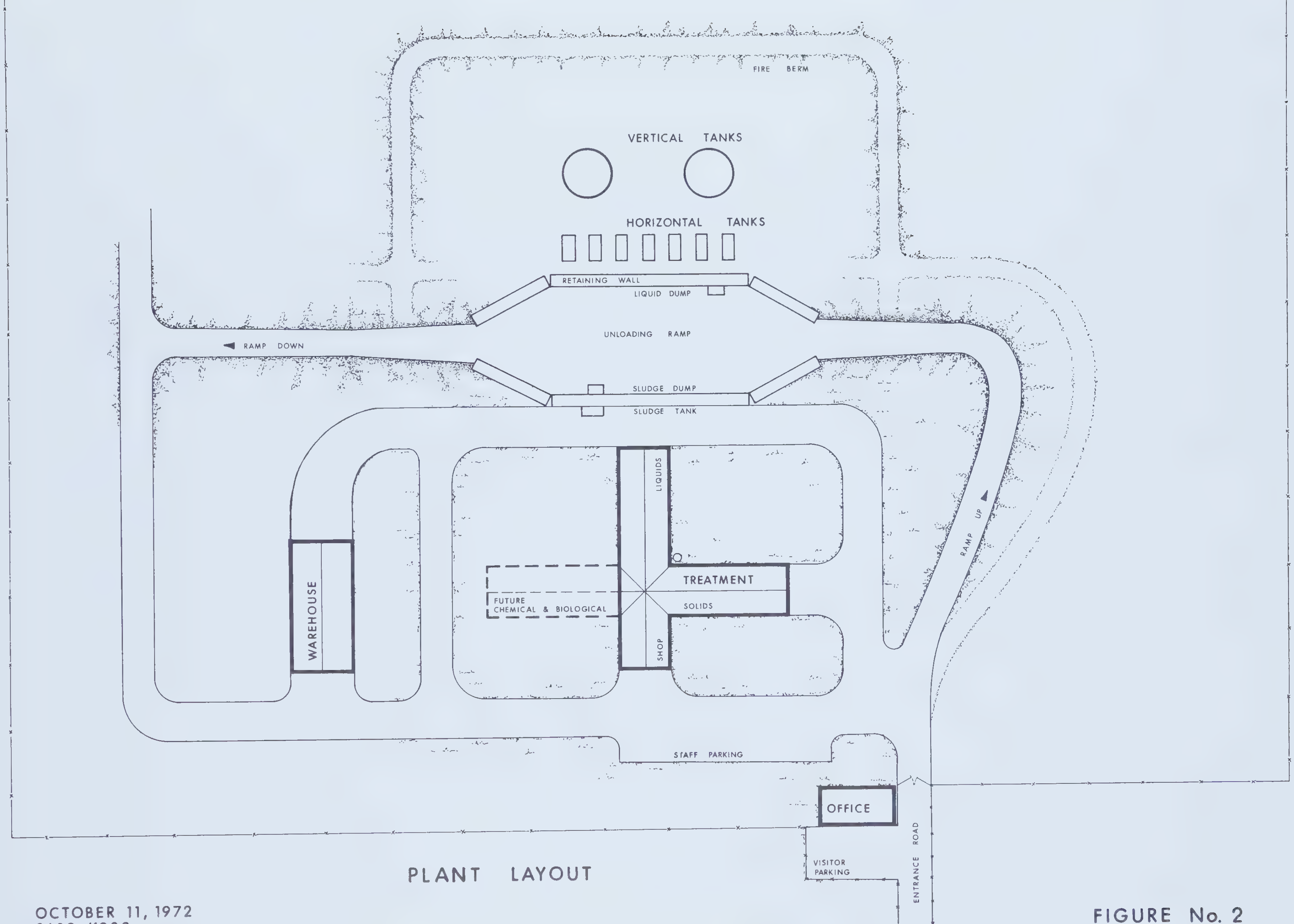

PLANT LAYOUT

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FIGURE No. 2

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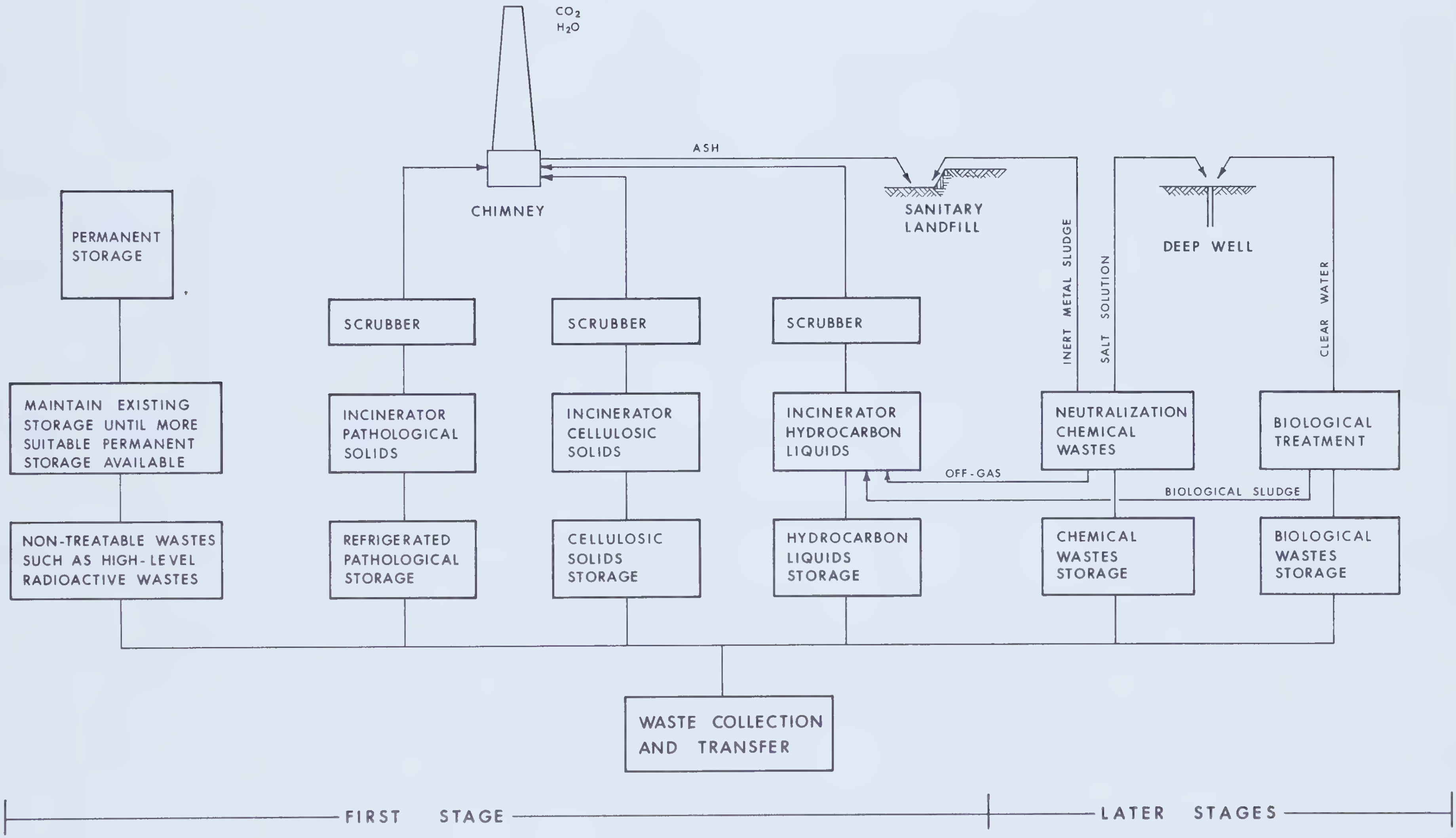

SCHEMATIC FLOW DIAGRAM SHOWING DEVELOPMENT OF MULTIPLE WASTE DISPOSAL FACILITY

OCTOBER 11, 1972
3689-K902

FIGURE No. 3

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TABLE II

STAGE I - COST ESTIMATE

Description of Cost Items	Cost (dollars)
Site Development: Roads, Sewers, Pavement, Curbs, Landscaping, and Fencing	$ 250,000
Receiving, Storage, and Blending Tanks, Pumps, Piping, Valves, Diked Area, Heating Equipment, and Mixers	165,000
Thermal Destruction Plant, Scrubbers and Building	825,000
Office Building, Laboratory, Machine Shop, Garage (Includes furnishings and equipment)	120,000
Drum Storage Building and Mobile Lift	80,000
SUB-TOTAL	$1,440,000
Engineering, Contingencies, and Construction Supervision	360,000
Land - 80 acres @ $2,000	160,000
Off site services - (paved road, water, power) (natural gas - approx. 1 mile)	165,000
TOTAL	$2,125,000

The following wastes would be handled in the proposed Stage I plant:

1. Pathological solids - including radioactive. A hot hearth (crematorium) type solids waste incinerator is best suited for this purpose. Materials containing radioactive wastes such as Carbon 14 would be incinerated in quantities small enough to meet air quality standards. Wastes containing heavy metals such as Cobalt 60 would be reduced by incineration to a radioactive ash and be removed to a radioactive storage site such as the Denfense Research Establishment Suffield (DRES).

2. Cellulosic solids (i.e. paper, tissues, paper sheets, etc.) and disposable plastics originating in hospital sick rooms would be handled in a solids waste incinerator designed for the purpose. This material is currently handled by incineration on site or by disposal with general hospital garbage in city land fill. The need for such a central facility seems to be greater in the Edmonton area where the hospitals have either old, inefficient incinerators or none at all. The Calgary situation may be less acute at this time since the Foothills Hospital has an on-site incinerator capable of handling the bulk of its cellulosic wastes and the University of Calgary Medical School is not yet fully developed.

3. Liquid hydrocarbons from institutions and industry would be handled in one liquid waste incinerator by blending the wastes to provide a combustible waste stream. It is conceived that all the liquid hydrocarbon wastes from the institutions would be handled plus a significant amount of the foreseeable industrial wastes.

4. Neutralized liquids that could be handled by deep well disposal could be disposed of by outside contract with a private company such as Chemcell which now operates a deep well disposal system.

5. Radioactive wastes should, in the Consultant's opinion, be delivered to the Defence Research Establishment Suffield for long term storage. Because of the time and effort that has gone into the investigation, development and approval of the Suffield site, it is not considered reasonable to duplicate such a facility. The long term nature of radioactive storage together with the relatively small quantities (approximately 500-600 cubic feet/year) of such wastes suggests that maximum advantage be taken of the existing facilities.

6. Byproducts of incineration would be handled as follows:

   (a) Ordinary Ash - in land fill on the plant site.

   (b) Radioactive Ash - packed in suitable containers and shipped to DRES.

   (c) Liquid effluent from scrubbing towers - trucked to an existing deep well system for disposal.

   (d) Solid effluent from scrubbing tower - in land fill on plant site.

(e) Gaseous discharge would be controlled by waste material feed mix or by effluent scrubbing to meet or exceed air quality standards.

Treatment and Disposal in Later Stages

The following materials would generally be excluded from treatment in the Stage I development and would thus have to be handled in later stages of development:

1. materials requiring biological, physical or chemical treatment or combinations of these processes - there is an infinite variety of these materials, usually in very small quanitities, that would require individual batch treatment. The unit capital and operational costs to treat these wastes would be very high in comparison to those costs for the wastes disposed of under Stage I;

2. institutional wastes in the Calgary area that may not be delivered to an Edmonton region plant either for economic or safety reasons - the extent of the Calgary plant would be decided on the basis of performance at the Edmonton plant and a review of the Calgary waste problem;

3. exotic chemical mixtures containing heavy metals that cannot be recycled to nature by existing process systems and that should be held in long term storage - the extent and magnitude of this problem may be further defined as a disposal facility is developed, and waste surveys such as are now being made on a national basis by the Federal Department of the Environment are completed.

Plant Operation

On arrival at the disposal facility, Figures 1, 2 & 3, trucks carrying solid pathological and cellulosic wastes would be unloaded inside the solids waste incinerator building. Under normal operations the wastes would be deposited into charging hoppers from which they would be fed directly into the incinerators. Refrigerated storage would be provided for pathological wastes for those occasions when immediate incineration was not possible. Ventilation would be designed so that the solids waste incinerator building would operate under a negative pressure and thus ensure that any air-borne contaminants would be directed through the incinerators.

Tank trucks carrying waste liquid hydrocarbons would be driven up onto the unloading ramp where wastes would be unloaded by gravity into receiving tanks, and then transferred either to the blending/storage tanks or directly to the incinerator. In addition to the obvious saving in pumping costs, this ramp provides an effective safety barrier separating the liquid storage area from the rest of the plant. The liquid storage would be designed primarily for blending of wastes at normal incineration production rates. Liquid wastes would be

transferred from the blending/storage tanks to the liquid hydrocarbon incinerator by pumps located in the liquid waste incinerator building. The incinerator would be sized for continuous operation.

All gaseous effluents including tank vents would be discharged to atmosphere through a scrubber/stack system designed to meet air quality standards. The small quantities of incinerator ash, which is the only solid by-product from the first stage development of the waste treatment facility, would be deposited in a sanitary land fill to be developed on the plant property.

Personnel safety in handling wastes is considered of primary importance. In view of the toxic and hazardous condition of some institutional wastes, special material handling facilities are proposed. The large volumes of institutional cellulosic wastes justify the installation of shredder units in hospitals and universities. These units reduce the bulk of such wastes (and shipping costs) up to 75%, and permit a standardization of waste transfer containers. These transfer containers would be designed to be effectively sealed at the point of loading and to remain sealed until emptied into the incinerators. Pathological waste would be double-wrapped in plastic bags and shipped in similar transfer containers. Equipment would be installed at the incinerators for disinfecting transfer containers after each use. In this way exposure of personnel to chemical or bacteriological hazards would be minimized.

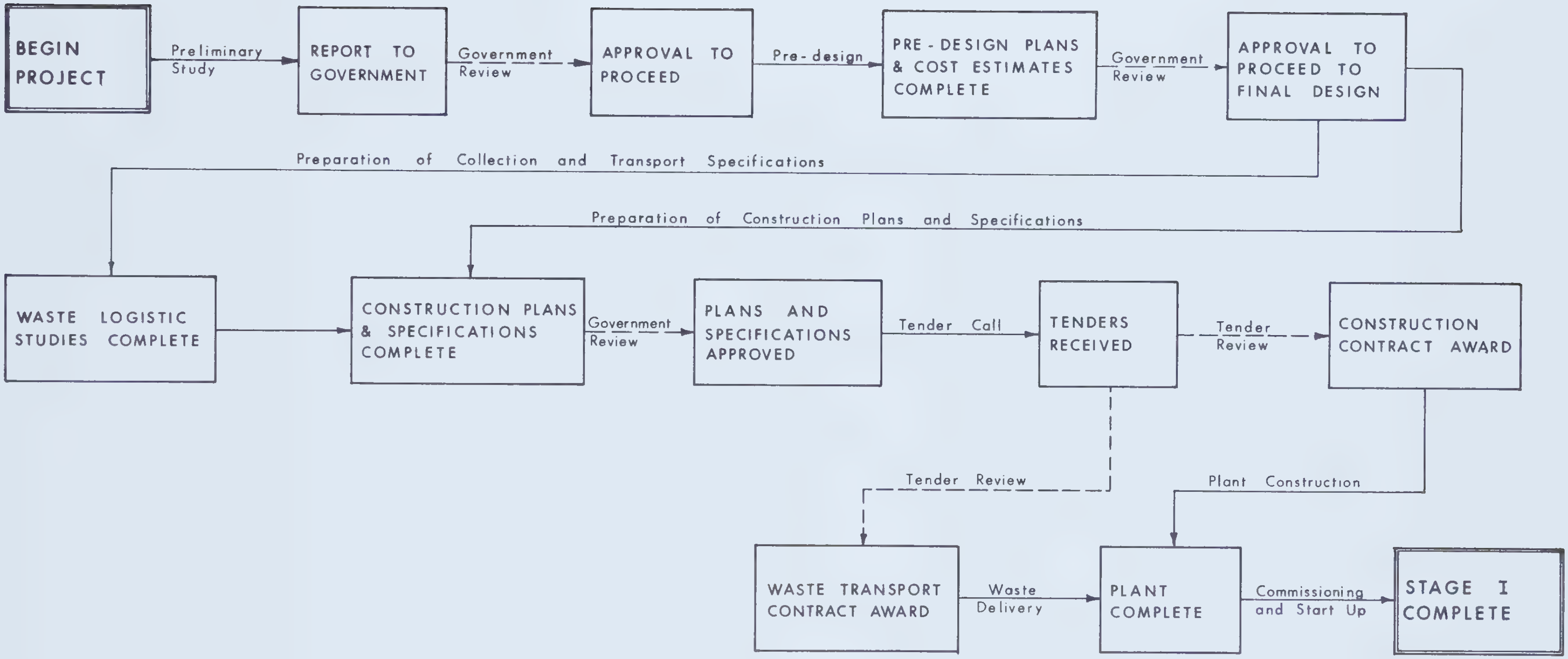
Although it is contemplated that most, if not all wastes, would arrive by highway transport, provision would be made for a future railroad siding if and when required.

Air monitoring controls would be provided early in the construction period to establish a base air quality condition before plant operation, and to ensure Government air pollution standards are met.

PROJECT DEVELOPMENT SCHEDULE

The Project Development Schedule, figure 4, outlines the objectives that must be accomplished to carry Stage I to completion. The project work has been divided into five sequential sections with provision for Government review between each section. The times required to complete the events in this schedule are estimated as follows:

Preliminary Study	-	completed
Planning Program	-	2 months
Design	-	3 months
Tender Call	-	1 1/2 months
Construction	-	6 months



PROJECT DEVELOPMENT SCHEDULE

OCTOBER 11, 1972
3689-K902

FIGURE No. 4

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IV. PLANNING PROGRAM

The proposed Stage I development of the Multiple Waste Treatment and Disposal Facilities outlined in this report is based on the general quantity, type and condition of toxic and hazardous wastes being produced in the Province of Alberta. Before engineering design of the facilities can be started, several in-depth studies must be undertaken to develop more specific data. The Planning Program schedule is shown on Figure 5.

Site Selection

It is essential that the plant site be selected early in the planning period to permit the design of services, utilities and plant layout to proceed. Assistance would be provided in investigation of alternate plant sites, and a comparative analysis of sites would be prepared for Government approval. In the interest of expediting this investigation Appendix A, Site Selection Specifications, is attached.

Liquid Wastes

A table of wastes from a selected group of major waste producers would be prepared and reviewed to confirm quantities, and chemical and thermal characteristics. This data would permit the selection of the appropriate type and size of disposal equipment.

Solid Wastes

A report describing the existing disposal facilities at the major institutions would be prepared and appraised to determine those facilities which are currently adequate and should be maintained, and those which should be upgraded to acceptable standards.

The Multiple Waste Treatment and Disposal Facilities would be designed to complement these units. The report would also identify those existing units which cannot be operated to acceptable standards and should be scrapped.

Waste Collection and Transfer

An appraisal would be made of existing institutional collection, handling and shipping facilities and a report prepared recommending a standardized system of compaction, loading, containerization and transfer of wastes to ensure maximum economy and safety in waste handling.

Regulated Wastes

Existing legislation would be reviewed and a list of regulated wastes proposed. Regulations could then be developed to ensure that toxic and hazardous wastes would be adequately treated on site or alternately directed to the Multiple Waste Treatment and Disposal Facilities.

The Planning Program Report would include the following:

1. Sketch plans of the Stage I installation.

2. Process equipment lists showing sizes and types.

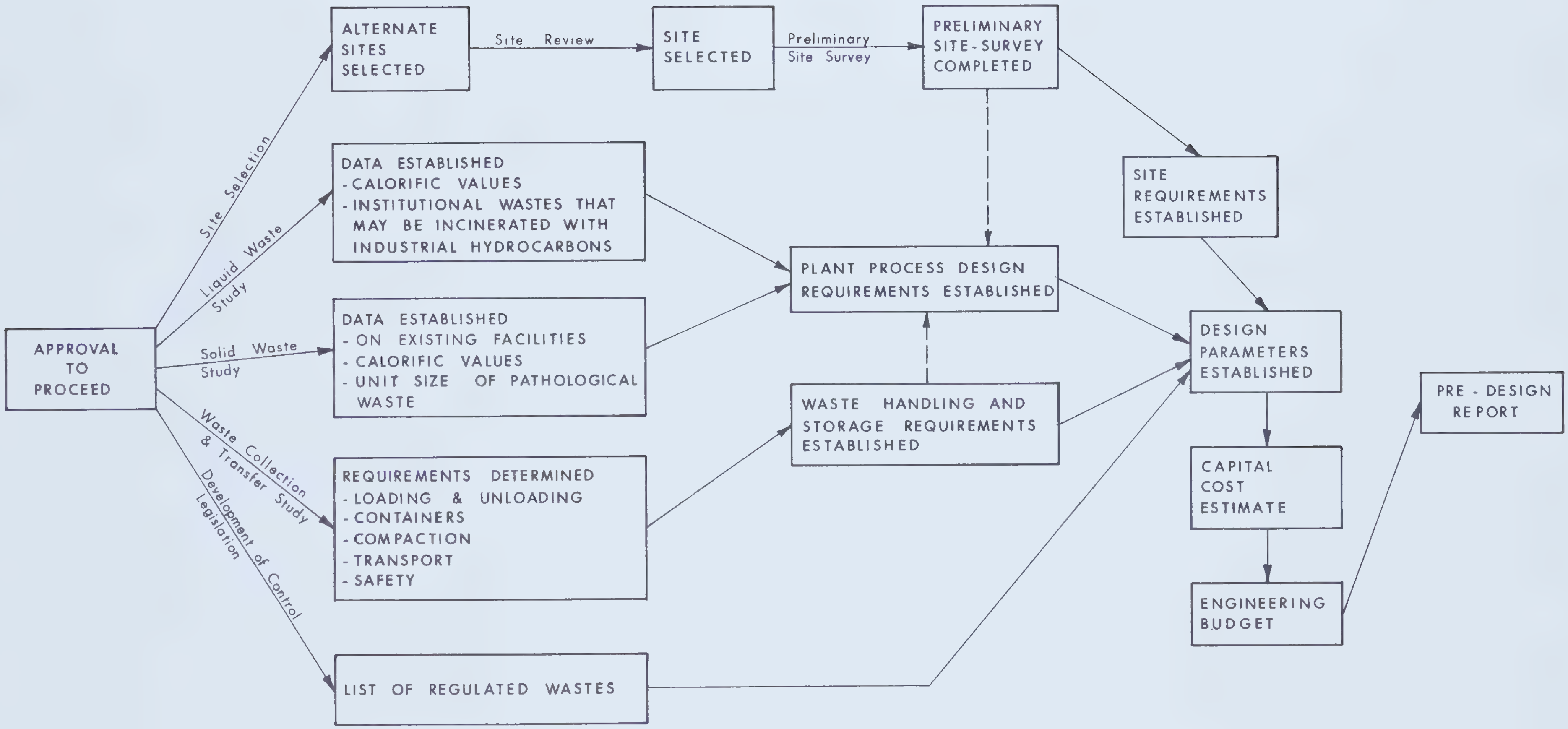
3. Appropriation grade cost estimate of the Stage I installation.

4. List of Regulated Wastes.

Planning Program Budget

An estimated time requirement budget has been developed for the Planning Program which indicates the need for 4 man months of specialist engineer's time plus 10 man months of senior engineering and technical support time. The estimated cost for these studies would be in the order of $50,000 for salaries and overhead, $10,000 for travel, telephone, printing and miscellaneous expenses plus $5,000 for third party assistance.

The proposed fee would be calculated in accordance with the minimum fee schedule of the Association of Professional Engineers, Geologists and Geophysicists of Alberta. (Reference our proposal dated August 1972)



PLANNING - PROGRAM SCHEDULE

OCTOBER 11, 1972
3689-K902

FIGURE No. 5

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APPENDIX A

SITE SELECTION SPECIFICATIONS

APPENDIX A

SITE SELECTION SPECIFICATIONS

The Planning Program Schedule shows that site selection places a restraint on the establishment of design requirements.

With reference to the Multiple Waste Treatment and Disposal report three main precepts must be kept in mind when choosing a waste disposal site.

1. Public health and safety must not be jeopardized.

2. Public acceptance must be obtained.

3. Reasonable economy of construction and operation must be achieved.

The site should:

1. be reasonably close to Edmonton,

2. be located in, or adjacent to, an established industrial park or area zoned for industry, preferably in the Leduc or Fort Saskatchewan area;

3. be reasonably close to all services including, first class roads, electric power, natural gas, potable water, and railway;

4. have the following physical characteristics -

   - reasonably level and away from a natural drainage basin, preferably non draining
   - low water table
   - suitable for land fill
   - soil conditions suitable for heavy construction
   - suitable for deep well disposal development;

5. have reasonable meteorological characteristics such as acceptable wind conditions and isolation from thermal inversions;

6. preferably be close to an established community such as Leduc where the plant could be properly landscaped and displayed to the public.

The plant should not be placed in an out-of-the-way location where it could be considered an undesirable facility and thus subject to poor public relations.

N.B. see c.1 of this publication for the section entitled An action plan for treatment and disposal of toxic and hazardous wastes in the Province of Alberta, Requirement and Proposal which follows Appendix A.